be absorbed while the remaining would be partly reflected and partly transmitted. This is probably the true explanation of selective absorption in gases, and it may be the explanation of selective absorption in solids and liquids. One thing that we should expect in the case of solids is, that more than one wave-length would be absorbed, because the molecules would not have a definite rate of vibration, but would vibrate at any rate between certain limits, though with unequal facility. That is, the vibration would be stunted by the attraction of the surrounding molecules.

It is a well-known fact that gases when heated radiate those wave-lengths which they are capable of absorbing when cold. Now if the above theory of selective absorption and reflection be true, we should expect a colored solid when heated to radiate light nearly complementary to that which it reflects when cold. This *seems* to be the case with copper, which has a greenish tint when melted, but whether there is such a thing as selective radiation from solids is not certain. The only way to settle this is by a spectrophotometric study of the light emitted by colored bodies in a state of incandescence.

SOME SPECIAL TESTS IN REGARD TO THE DELICACY OF THE SENSE OF SMELL.

BY E. H. S. BAILEY AND L. M. POWELL.

[Abstract.]

At the Philadelphia meeting of the American Association for the Advancement of Science, E. H. S. Bailey and E. L. Nichols presented the results of some experiments on the special senses. The object of the present investigation is to continue these experiments with special attention to the sense of smell. It is doubtless true that, in the process of smelling and tasting, actual contact with the substance must take place, and the substance must be soluble, or must be floating in the air in minute particles.

As we wish to form some idea in regard to the delicacy of this sense, and the effect of education upon it, and to compare it with chemical tests for the determination of substances, we have used as test solutions the following:

Oil of lemon, 1 part in 4,000 parts of water; oil of wintergreen, 1 part in 2,700 parts of water; Prussic acid, 1 part in 512 parts of water; caustic potash, a dilute solution.

The oils were obtained in solution in water by grinding with magnesia, and filtering. All the solutions were successively diluted so that each bottle was one-half the strength of the previous one in the series, and the dilution was continued till it was impossible to detect the substances by smell. Tests were made by 21 females and 27 males, each one attempting to classify in four groups, as above. Although the number tested is too small to justify an absolute conclusion, yet it is valuable as indicating probable results. The average was as follows:

AMOUNT DETECTED.

	Prussic acid.	*Oil of lemon.*	*Oil of wintergreen.*
Average of 27 males, ...	1 part to 112,000 of water.	1 to 280,000	1 to 600,000
Average of 21 females, ...	1 part to 18,000 of water.	1 to 116,000	1 to 311,000
General average, ...	1 part to 65,000 of water.	1 to 198,000	1 to 455,500

Three of the males were able to detect one part of Prussic acid in about 2,000,000 parts of water. Two of these were persons engaging in occupations favoring the cultivation of this sense. Careful chemical tests were made for Prussic acid, but it was not detected below the bottle containing 1 part HCN in 131,000 parts of water. More delicate tests can probably be made by the use of the microscope.

Dr. Otto regards the sense of smell as one of the very best means of detecting this acid. Orfida, Lounsdale and Christison coincide with him, and our investigation points in the same direction. Profs. Wormley and Taylor, however, consider a chemical test more reliable and delicate.

It will be noticed that the sense of smell seems to be more delicate in males than in females. This result coincides with that previously obtained by Profs. Bailey and Nichols, while the females possessed a more delicate sense of taste.

We are able to detect smaller quantities of substances with which we are perfectly familiar, as oil of wintergreen. Without doubt education has much to do with the delicacy of this special sense, for in addition to the fact that persons who have occasion to use the sense are more skillful, we have noticed that some who at first cannot tell Prussic acid from ammonia soon learn to distinguish readily between them.

IS THE RAINFALL OF KANSAS INCREASING?

BY PROF. F. H. SNOW, OF THE UNIVERSITY OF KANSAS.

In the present paper attention is called to the fact of an increase of rainfall rather than to the various theories which have been advanced to explain such increase, or to show that there ought to be an increase.

Geologists, physicists and astronomers are harmonious in accepting it as an established fact that the earth, in common with all other worlds in the universe, is slowly passing through a series of changes from an original nebular mass of intensely high temperature to an entirely solid mass of very low temperature. The sun and the larger planets of our system illustrate the early stages in this series of changes. The earth is in an intermediate condition between the two extremes, and the earth's moon represents the extreme of entire solidity, in which the waters and the atmosphere which once covered and surrounded its surface have been absorbed within its mass, and a very low temperature continually and everywhere prevails. There can be no doubt that the earth is very gradually approaching the moon's condition, and that sometime in the far distant future, how many millions of years hence no man can determine, its atmosphere and surface waters will entirely disappear and a low temperature prevail, even in its tropical regions, far exceeding the cold of the coldest Arctic winters in the present age. There can be no doubt, therefore, that, considered with reference to long periods of time, the rainfall of the earth is diminishing. If prehistoric man, 10,000 years ago, had kept scientific records of the rainfall of his time, and it were possible to compare these records with those of the present day, it would be found that a considerable reduction of the average annual precipitation has been made in the period named. Even a thousand years might show a perceptible decrease. But in so short a period as the lifetime of a single generation of men, or even in an entire century, the average annual rainfall of the entire globe has probably been reduced to so slight an extent as to be expressed by a very few hundredths of an inch.

Yet, although the entire movement is in the direction of a reduction of the rainfall, there are without doubt local oscillations in consequence of man's influence upon nature, which in some cases result in a more rapid decrease than would otherwise be accomplished by the unaided forces of nature, and in other cases within limited areas secure an actual increase in the rainfall. I believe the State of Kansas furnishes an apt illustration of a change of the latter sort. Here the circumstances have been extremely favorable to such a change. Thirty years ago the Territory of Kansas was not occupied by the white man, and if we except a few acres cultivated by the Delaware Indians, no portion of her soil had been turned up by the plow. Her entire area was included